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Finite element simulations of A1100 / A3003 (A6063) sandwich sheet rolling processing

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Abstract

This study performs DEFORMTM 3D three-dimensional finite element simulations to analyze the plastic deformation of A1100 / A3003 sandwich sheets during rolling. The finite element code is based on a rigid-plastic model, and the simulations in this study assume that the rollers are rigid bodies and that the deformation-induced change in temperature during rolling is negligible. The rolled product comprises a central sheet of A1100 aluminum alloy sandwiched between upper and lower sheets of either A3003 or A6063 aluminum alloy. The simulations examine the effects of sheet thickness and reduction ratio on the maximum effective stress, maximum effective strain, Y-direction load, and maximum damage induced within the rolled product. This study also compares the simulation results for the final thicknesses of the three layers in the rolled A1100 / A3003 (A6063) sandwich sheet with experimental measurements and bonding conditions.

Key words: Finite Element (FE); Plastic Deformation; Sandwich Sheet